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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/754,151	01/09/2004	Andrey E. Yakshin	FMW-BL (CZ 0100 US)	7473

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EXAMINER	
BAND, MICHAEL A	

ART UNIT	PAPER NUMBER
1709	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/754,151	YAKSHIN ET AL.	
	Examiner	Art Unit	
	Michael Band	1709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *19-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 January 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/4/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, claims 1-18 in the reply filed on March 28, 2007 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. Non-elected claims 19-38 are hereby withdrawn.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the magnetic field extending to the substrate in claims 14-17 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for

consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-2 and 10-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Pinarbasi (US Patent No. 5,492,605).

With respect to claim 1, Pinarbasi '605 discloses "an ion beam sputter deposition system and method for the fabrication of multilayered thin film structures" (abstract), and that using a magnetron sputter-deposition device for fabrication of thin film devices is well known in the art (col. 1, lines 17-19). Pinarbasi '605 further discloses that during operation, a "vacuum chamber is maintained at an internal operation pressure on the

order of $1x10^{-4}$ Torr by a vacuum pump" (col. 5, lines 1-3). Pinarbasi '605 depicts figure 2 having a target (part 23) and substrate (part 31), with a distance between the target and the substrate.

With respect to claim 2, Pinarbasi '605 further discloses "an ion beam sputter deposition system and method for the fabrication of multilayered thin film structures" (abstract), and that using a magnetron sputter-deposition device for fabrication of thin film devices is well known in the art (col. 1, lines 17-19). Pinarbasi '605 further discloses that during operation, a "vacuum chamber is maintained at an internal operation pressure on the order of $1x10^{-4}$ Torr by a vacuum pump" (col. 5, lines 1-3). Pinarbasi '605 depicts figure 2 having a target (part 23) and substrate (part 31), with a distance between the target and the substrate. Pinarbasi '605 states that "the mean free path for both sputtered target ions and the backscattered neutral atoms generally is greater than the distance between the target and the substrate" (col. 5, lines 56-58).

With respect to claims 10-11, Pinarbasi '605 further depicts figure 4b, with Krypton ions being used between 400 and 1250 eV (col. 6, Table I). Pinarbasi '605 further discusses that in a specific example, Kr gas at 750 eV is used to deposit a metallic layer (col. 11, lines 40-42).

6. Claim 3-4, 8-9, 12-13, 15, and 17 are rejected under 35 U.S.C. 102(e) as being anticipated by Donohue et al (USPGPub 2003/0024808).

With respect to claim 3, Donohue '808 discloses a method of sputtering a layer from a target using Krypton as the sputtering gas at a pressure of less than 1 millitorr (abstract). Donohue '808 further discloses that the distance from the target to the wafer

(i.e. substrate) is 430 mm (i.e. 43 cm) (p.1, para 14). Donohue '808 further states that the pressure is kept at 0.85 millitorr (i.e. approximately 0.1133 Pa) for the sputtering apparatus. Maintaining the pressure at 0.85 millitor and the distance from target to wafer at 430 mm would result in a pressure and distance product of approximately 4.87 cmPa, thus larger than 2.0 cmPa.

With respect to claim 4, Donohue '808 further discloses "switching to Krypton enables lower pressure operation ~0.15 millitor" (i.e. 0.02 Pa) (p.1, para 17) of the sputtering apparatus while still keeping the distance between target and wafer at 430 mm. The product of this pressure and said distance is approximately 0.86 cmPa, thus smaller than 2.0 cmPa.

With respect to claims 8 and 9, Donohue '808 further depicts figure 1 having a moving magnetron (part 1) and a magnet on either side of the magnetron (p. 1, para 13). As the magnet moves the magnetic field intensity is altered, thereby creating an unbalanced magnetron.

With respect to claims 12 and 13, Donohue '808 further discloses that the substrate may be negatively biased for operation at low pressures (p. 1, para 6) using a power supply (p. 1, para 13). Donohue '808 also states that the distance between the target to wafer (i.e. substrate) is 430 mm (i.e. 43 cm) (p. 1, para 14). Donohue '808 further states that using Krypton gas enables lower pressure operation of the apparatus (p. 1, para 18).

With respect to claim 15, Donohue '808 further discloses a plasma in proximity of the target (figure 1, parts 2 and 10) confined by a magnetic field with a wafer (i.e.

substrate) being biased by a power supply (p. 1, para 13). The voltage being applied to the target and plasma source is 135 volts (p. 1, para 14).

With respect to claim 17, Donohue '808 further discloses the plasma source is a magnetron (p. 1, para 13; figure 1, parts 1 and 10). The bias voltage being applied is 135 volts (p. 1, para 14).

7. Claim 18 is rejected under 35 U.S.C. 102(e) as being anticipated by Miyamura et al (US Patent No. 6,635,155).

With respect to claim 18, Miyamura '155 discloses an invention for "preparing an optical thin film having multiple optical layers (col. 1, lines 8-10) formed using electron beam evaporation (col. 1, line 17). Miyamura '155 further states that the optical layers formation can be accomplished by sputtering (col. 1, line 17-18) or magnetron sputtering (col. 2, line 3). Miyamura '155 also states that a gas supply system is present for a working gas (figure 1, part 7) with a working gas inlet (figure 1, part 71) to regulate the gas pressure. Miyamura '155 also depicts in figure 1 that there is a distance between a target (part 4) and substrate (part 8).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Donohue et al (USPGPub 2003/0024808) as applied to claim 3 above, and further in view of Telford et al (US Patent No. 5,643,633).

With respect to claim 5, the reference is cited as discussed for claim 3. Donohue '808 further discloses that 0.85 millitorr pressure (p. 1, para 17) was attempted, giving a value greater than 2.0 cmPa. Subsequently switching to a pressure of ~0.15 millitorr gave a value smaller than 2.0 cmPa. However Donohue '808 is limited in that while it does disclose two distinct products for working gas pressure and distance between the target and substrate, Donohue '808 does not discuss separating the deposition process into two stages.

Telford '633 teaches a technique for a film deposited by chemical vapor deposition (abstract) by a method such as sputtering (col. 1, lines 45-47). Telford '633 further teaches using a two-stage process, the first stage comprising a high pressure first stage, followed by a low pressure second stage (col. 7, lines 55-60). Telford '633 lists the advantage of this two-stage pressure differential as overcoming a tendency of contamination that would exist between the two stages (col. 7, lines 60-63).

It would have been obvious to one of ordinary skill in the art to separate the vacuum chamber into two deposition parts of distinct pressures taught in Telford '633 in the sputtering apparatus of Donohue '808 in order to gain the advantage of decreasing the contamination that exists between the two deposition stages.

10. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinarbasi US Patent No. 5,492,605) as applied to claims 1 and 2 above, and further in view of Gupta et al (*Vacuum Technology & Coating*).

With respect to claims 6 and 7, the reference is cited as discussed for claims 1 and 2. Pinarbasi '605 further discloses using magnetic fields applied to a workpiece (i.e. substrate) for certain material depositions or to prevent electrons from traveling directly to the anode, thus increasing ionization efficiency and beam uniformity (col. 4, lines 64-66; col. 5, lines 16-19). However Pinarbasi '605 is limited in that while it does discuss using a magnetic field, Pinarbasi '605 does not discuss the magnetic field moving (i.e. unbalanced).

Gupta teaches a method of sputtering a layer from a target utilizing sputtering gas (p. 4, para 2). Gupta further teaches using a moving magnetron (i.e. linear scanning) (p. 1, para 1). As the magnet moves the magnetic field intensity is altered, thereby creating an unbalanced magnetron. Gupta lists the advantages of using a Linearly Moving Magnetron (LMM) as exceptionally high uniformities and repeatabilities (p. 1, para 2 and 4; p. 3, para 3; p. 4, para 5; p. 5, para 1).

It would have been obvious to one of ordinary skill in the art to use the moving magnetron taught in Gupta as the magnetron in Pinarbasi '605 in order to gain the advantages of exceptionally high uniformities and repeatabilities.

11. Claims 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pinarbasi US Patent No. 5,492,605) as applied to claim 1 above, and further in view of Donohue et al (USPGPub 2003/0024808).

With respect to claims 14 and 16, Pinarbasi '605 further discloses that "it is well known in the prior art to utilize RF or DC magnetron sputter-deposition apparatus for fabrication of thin film devices" (col. 1, lines 17-20). Pinarbasi '605 also states that "such sputter devices are characterized by crossed electric and magnetic fields in an evacuated chamber into which an inert, ionizable gas gas" is introduced (col. 1, lines 20-22) "which forms a plasma in proximity to a target structure" (col. 1, lines 24-25). Pinarbasi '605 further discusses how "a magnetic field may [also] be applied at the workpiece (i.e. substrate)" (col. 4, lines 64-65). Pinarbasi '605 also describes how a target and substrate are connected in a RF/DC circuit (col. 2, lines 1-2). However, Pinarbasi '605 is limited in that while it does describe an electric circuit between a target and substrate, a specified voltage is not listed.

Donohue '808 teaches a sputtering RF/DC magnetron (p. 1, para 14) with a plasma in proximity of the target (figure 1, parts 2 and 10) confined by a magnetic field with a wafer (i.e. substrate) being biased by a power supply (p. 1, para 13). Donohue '808 further teaches the plasma source is a magnetron (p. 1, para 13; figure 1, parts 1 and 10). The voltage being applied to the target and plasma source (i.e. surface to be etched bias voltage) is 135 volts (p. 1, para 14).

It would have been obvious to one of ordinary skill in the art to use the voltage of Donohue '808 as the voltage in the circuit for Pinarbasi '605 since Pinarbasi '605 fails to disclose a specific voltage and since Donohue '808 teaches such voltages are functional in such devices, one would have a reasonable expectation of success in using the voltages of Donohue '808 in Pinarbasi '605.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent No 5,431,794; US Statutory Invention Reg. H1933; US Patent No. 5,938,897; US Patent No. 6,893,542; US Patent No. 4,957,604; US Patent No. 6,878,241; US Patent No. 6,190,511.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

14. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB

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PRIMARY EXAMINER